



# **Bioterrorism: An Overview**

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# **Bioterrorism**

- + Intentional or threatened use of viruses, bacteria, fungi, or toxins from living organisms to produce death or disease in humans, animals, or plants**



# History of Biological Warfare

+ 14th Century: Plague at Kaffa





# History of Biological Warfare

**+ 18th Century: Smallpox Blankets**





# History of Biological Warfare

## + 20th Century:

- 1943: USA program launched
- 1953: Defensive program established
- 1969: Offensive program disbanded



# **Biological Warfare Agreements**

- + 1925**      **Geneva Protocol**
- + 1972**      **Biological Weapons  
Convention**
- + 1975**      **Geneva Conventions  
Ratified**



# **Bioterrorism**





# **Bioterrorism:**

## ***Who are 1st Responders?***

- + Primary Care Personnel
- + Hospital ER Staff
- + EMS Personnel
- + Public Health Professionals
- + Other Emergency Preparedness Personnel
- + Laboratory Personnel
- + Law Enforcement



# Potential Bioterrorism Agents

## + Bacterial Agents

- Anthrax
- Brucellosis
- Cholera
- Plague, Pneumonic
- Tularemia
- Q Fever

## + Viruses

- Smallpox
- VEE
- VHF

## + Biological Toxins

- Botulinum
- Staph Entero-B
- Ricin
- T-2 Mycotoxins

Source: U.S. A.M.R.I.I.D.



## Biological Agents of Highest Concern

- + *Variola major* (Smallpox)
- + *Bacillus anthracis* (Anthrax)
- + *Yersinia pestis* (Plague)
- + *Francisella tularensis* (Tularemia)
- + Botulinum toxin (Botulism)
- + Filoviruses and Arenaviruses (Viral hemorrhagic fevers)
- + ALL suspected or confirmed cases should be reported to health authorities immediately



**Smallpox**



Smallpox

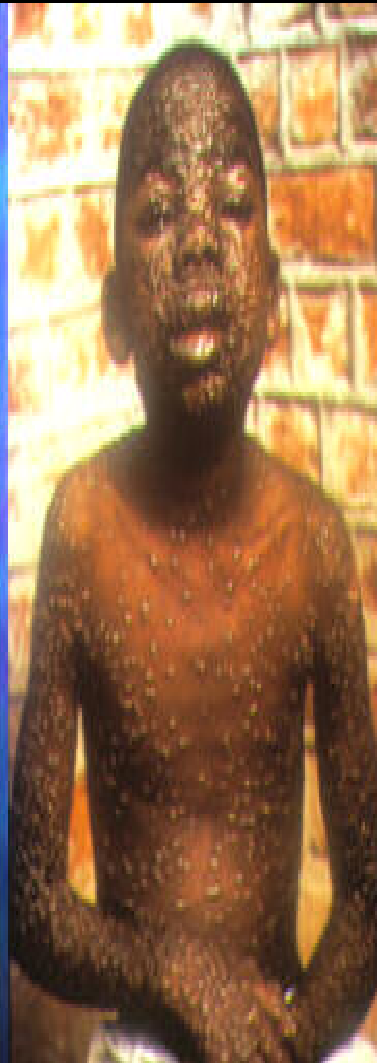




Figure 1. Parapox lesion, showing a crusting scab.

**Parapox**

**Parapox**



Figure 2. Anthrax lesion, showing a black necrotic center.

**Anthrax**

**Anthrax**



# Advantages of Biologics as Weapons

- + Infectious via aerosol
- + Organisms fairly stable in environment
- + Susceptible civilian populations
- + High morbidity and mortality
- + Person-to-person transmission (smallpox, plague, VHF)
- + Difficult to diagnose and/or treat
- + Previous development for BW



## Advantages of Biologics as Weapons

- + Easy to obtain
- + Inexpensive to produce
- + Potential for dissemination over large geographic area
- + Creates panic
- + Can overwhelm medical services
- + Perpetrators escape easily





# **Bioterrorism: How Real is the Threat?**

**Hoax vs. Actual BT Event**



# Anthrax *Bioterrorism*

## Anthrax hoax at federal building delays 91 in L.A.

By David Mervin

LOS ANGELES — Six days after a major health scare, city health officials said that the anthrax scare was a hoax. The city had been closed for three days.

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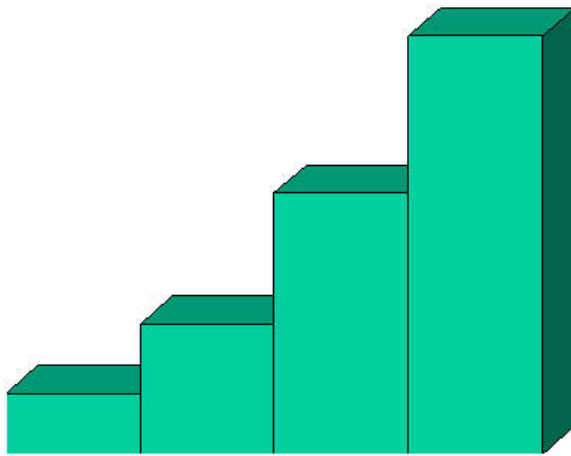
San Francisco Chronicle, 20 December 1998



(COURTESY KTLA)



# Threats reported to FBI



Source: FBI personal communication





# Chemical & Biological Terrorism

- 1984: The Dalles, Oregon, *Salmonella* (salad bar)
- 1991: Minnesota, ricin toxin (hoax)
- 1994: Tokyo, Sarin and biological attacks
- 1995: Arkansas, ricin toxin (hoax)
- 1995: Ohio, *Yersinia pestis* (sent in mail)
- 1997: Washington DC, “Anthrax” (hoax)
- 1998: Nevada , non-lethal strain of *B. anthracis*
- 1998: Multiple “Anthrax” hoaxes



# **Salmonellosis Caused by Intentional Contamination**

**4The Dalles, Oregon in Fall of 1984**

**4751 cases of *Salmonella***

**4Eating at salad bars in 10 restaurants**

**4Criminal investigation identified perpetrators as followers of Bhagwan Shree Rajneesh**

SOURCE: Torok et al. JAMA 1997;278:389



Source: ASAHI SHIMBUN SIPA

CDC  
U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES

Source: ASAHI SHIMBUN SIPA





## **Clinical Status of Patients Exposed to Sarin on March 21, 1995**

<b>Dead</b>	<b>8</b>
<b>Critical</b>	<b>17</b>
<b>Severe</b>	<b>37</b>
<b>Moderate</b>	<b>984</b>
<b>Outpatient</b>	<b>4,073</b>
<b>Unknown</b>	<b>391</b>
	<hr/>
<b>Total</b>	<b>5,510</b>



## **Shigellosis Caused by Intentional Contamination**

- 4 Dallas, Texas in Fall of 1996**
- 4 12 (27%) of 45 laboratory workers in a large medical center had severe diarrheal illness**
- 4 8 (67%) had positive stool cultures for *S. dysenteriae* type 2**
- 4 Eating muffins or donuts in staff break room implicated**
- 4 PFGE patterns indistinguishable for stool, muffin, and laboratory stock isolates**
- 4 Criminal investigation in progress**

SOURCE: Kolavic et al. JAMA 1997;278:396

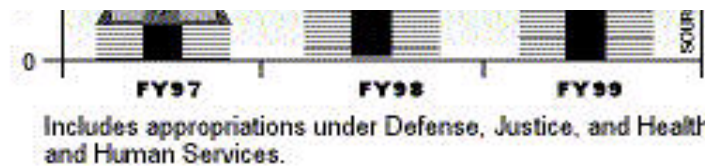
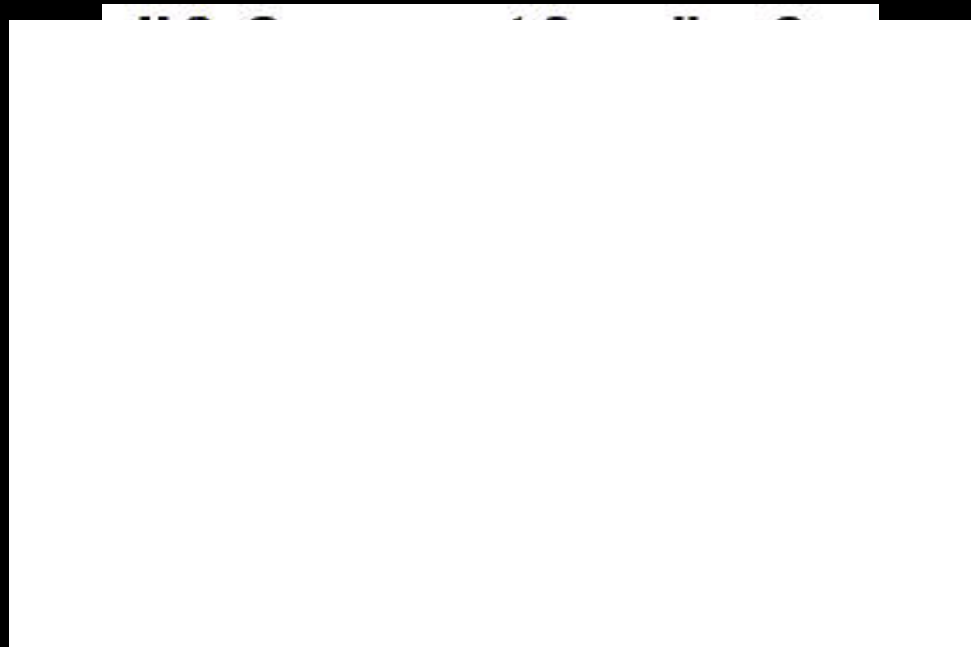


# **Federal Agencies Involved in Bioterrorism**

- + NSC**
- + DOD**
- + FEMA**
- + DOJ**
- + DHHS**
- + Treasury**
- + EPA**
- + FBI**
- + PHS**
- + CDC**
- + Secret Service**
- + USDA**
- + FDA**
- + SBCCOM**
- + USAMRIID**
- + OEP**



# Cost of Bioterrorism





# Agent Transmission



# Routes of Infection

## + Skin

- Cuts
- Abrasions
- Mucosal membranes



# Routes of Infection

## + Gastrointestinal

### – Food

- Potentially significant route of delivery
- Secondary to either purposeful or accidental exposure to aerosol

### – Water

- Capacity to affect large numbers of people
- Dilution factor
- Water treatment may be effective in removal of agents



# Routes of Infection

## + Respiratory

- Inhalation of spores, droplets & aerosols
- Aerosols most effective delivery method
- 1-5µm droplet most effective





# **Medical Response to Bioterrorism**



# Medical Response

## + Pre-exposure

- active immunization
- prophylaxis
- identification of threat/use



# Medical Response

## + Incubation period

- diagnosis
- active and passive immunization
- antimicrobial or supportive therapy



# Medical Response

## + Overt disease

- diagnosis
- treatment
  - may not be available
  - may overwhelm system
  - may be less effective
- direct patient care will predominate



# Public Health Response to Bioterrorism



## Priorities for Public Health Preparedness

- + Emergency Preparedness and Response
- + Enhance Surveillance and Epidemiology
- + Enhance Laboratory Capacity
- + Enhance Information Technology
- + Stockpile

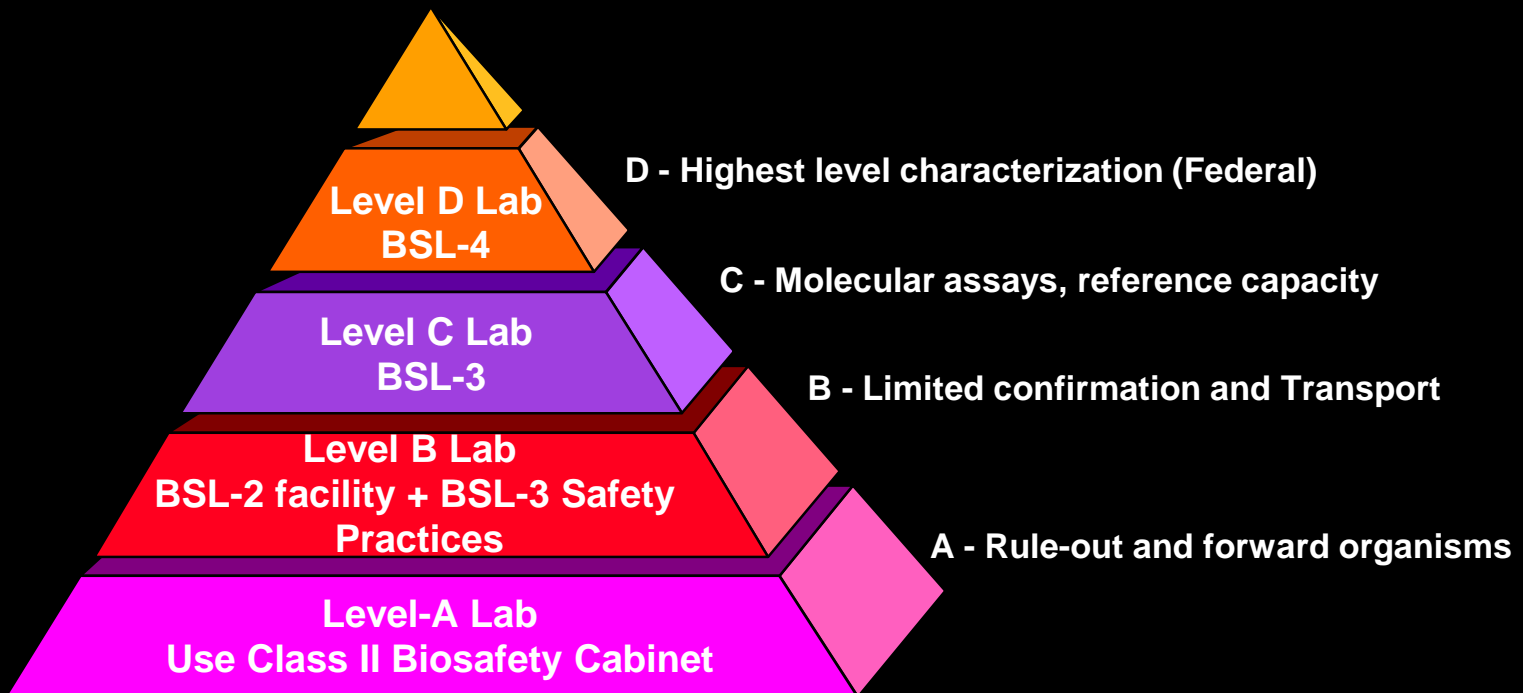


## **Components of a Public Health Response to Bioterrorism**

- + \* Detection - Health Surveillance**
- + \* Rapid Laboratory Diagnosis**
- + \* Epidemiologic Investigation**
- + \* Implementation of Control Measures**



# Laboratory Response Network For Bioterrorism







## **CDC BT Rapid Response and Advanced Technology Lab**

- + BSL -3
- + Agent Identification and Specimen Triage
- + Refer to and Assist Specialty Lab Confirmation
- + Evaluate Rapid Detection Technology
- + Rapid Response Team



# **Biотerrorism:**

## ***What Can Be Done?***

- + Awareness
- + Laboratory Preparedness
- + Plan in place
- + Individual & collective protection
- + Detection & characterization



# **Biотerrorism:**

## ***What Can Be Done?***

- + Emergency response
- + Measures to Protect the Public's Health and Safety
- + Treatment
- + Safe practices